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No. 4

The Distribution of Southern California Pteridophytes.

PHILIP A. MUNZ AND IVAN M. JOHNSTON¹

4. POLYSTICHUM.

A. Fronds once pinnate, 3 to 9 dm. long; middle altitudes.

P. munitum.

AA. Fronds with basal pinnae again pinnate, less than 3 dm. long;
high altitudes.

P. scopulinum.

POLYSTICHUM MUNITUM (Kaulf.) Presl. Tent. Pterid. 83.
1836.

Sword Fern.

Aspidium munitum Kaulf. *Dyopteris munita* Kuntze.
Nephrodium plumula Presl. *Polystichum plumula* Presl.
Aetopteron munitum (Kaulf.) House.

Illus.: Eaton, Ferns No. Am. pl. 25, f. 1. 1879.
Hall, A Yosemite Flora, p. 38. 1912. Frye & Jackson,
Am. Fern Jour. 4, pl. 12, f. 1: pl. 13, f. 1-2. 1914.

Occurring only on the coastal slopes, where abundant
on shaded stony canyon sides of the Upper Sonoran Zone,
usually above 3000 ft. alt. This fern, typical of the upper
chaparral belt, occasionally extends to much higher
altitudes (Johnston, Pl. World 22: 79. 1919) and reaches
an altitude of at least 8600 ft! (*Munz 6087*). Reported
from below 1500 ft. alt. near Box Springs Mts. east of
Riverside by Reed (*Muhlenbergia* 5: 94. 1909). Occur-
ring on Santa Cruz Island! (*Greene, Bull. Cal. Acad.* 2:
415. 1887).

¹ Continued from p. 77.

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POLYSTICHUM SCOPULINUM (D. C. Eaton) Maxon. Fern Bull. **8**: 29. 1900.

Aspidium aculeatum var. *scopulinum* D. C. Eaton.
Aetopterum scopulinum (D. C. Eaton) House.

Illus.: Eaton, Ferns No. Am. **2**, pl. 62, f. 8. 1880.
Frye & Jackson, Am. Fern. Jour. **4**, pl. 13, f. 8. 1914.
Britton & Brown, Illus. Flora, **1**: f. 35. 1913.

Known in our range only from Snow Canyon! in the San Bernardino Mts. where it is locally abundant in rock-crevices in the Hudsonian Zone (Parish, Zoe **5**: 110. 1901. Fern Bull. **12**: 11. 1904. Pl. World **4**: 229. 1901, and **20**: 170. 1917), and from the divide between Little Rock Tributary and Bear Creek in the San Gabriel Mts.! where it grows in the Transition Zone at 6500 ft. alt. (*F. W. Peirson 2464*).

5. ATHYRIUM.

ATHYRIUM FILIX-FEMINA (L.) Roth, var. **CALIFORNICUM** Butters. Rhodora **19**: 201. 1917.

Lady fern.

Illus.: Hall, A Yosemite Flora, p. 37, f. 1. 1912.

Occasional in boggy places and along streams in the Transition Zone of the San Jacinto! (McClatchie, Proc. of So. Cal. Acad.: 393. 1897.) and of the San Bernardino Mts.! (Parish, Pl. World **20**: 170. 1917). It also occurs on Santa Cruz Island! (Greene, Bull. Cal. Acad. **2**: 416. 1887). In the mountains the lady fern takes on two forms, one with rather narrow, strict fronds and forming close clumps, the other with more lax, delicate, ample fronds and forming loose clumps in sheltered situations. On Santa Cruz Island the latter type only is found.

6. ASPLENIUM.

ASPLENIUM VESPERTINUM Maxon. Bull. Torrey Cl. **27**: 197. 1900.

Illus.: Maxon, Contr. U. S. Nat. Herb. **17**: 142, f. 3. 1913.

Growing in moist shaded places under rocks in hills and canyons of the coastal slopes in the Upper Sonoran Zone, below 3000 ft. alt. Fairly common in San Diego County! (Maxon, Contr. U. S. Nat. Herb. **17**:142. 1913). In Los Angeles County it has been collected in Puddingstone Canyon! of the San Jose Hills (*Munz, Street & Williams 2454*), and in most of the canyons along the southern base of the San Gabriel Mts. from Millards Canyon! to San Gabriel Canyon! In San Bernardino County known only from Cucamonga Canyon! in the San Gabriel Mts. (*Johnston 80, 2172*). In Riverside County it has been found only in the hills south of San Bernardino (Parish, Fern Bull. **12**: 9. 1904), and in Leach Canyon! on the east base of the Elsinore Mts. (*Munz 5036*.) This fern is the *A. Trichomanes* var. *incisum* of the Bot. Cal. **2**: 344, 1880 and of latter authors. Type locality at San Miguel Mt., San Diego County.

7. WOODWARDIA.

WOODWARDIA CHAMISSOI Brack. Wilkes U. S. Explor. Exped. **16**: 138. 1854.

Great chain fern.

Woodwardia radicans Smith var. *americana* Hooker, in part.

Illus.: Eaton, Ferns No. Am. pl. 61. 1880. Frye & Jackson, Am. Fern. Jour. **4**, pl. 16, f. 3-4. 1914. Hall, A Yosemite Flora, p. 36. 1912.

Frequent, often forming dense thickets 4 to 6 ft. high, in boggy places in shaded canyons on the coastal slopes; occurring in the Upper Sonoran Zone and ascending to an elevation of 5000 ft. Reaching the edge of the desert, as at Laguna Mts.! (*Eastwood 9248*), Warners Hot Springs! (*Buttle*, Cal. Acad. Herb.), Tahquitz Canyon! (*Labouchere*, U. C. Herb.) and Whitewater! (*Vasey 14*). On the islands it has been found only on Santa Cruz! (Greene, Bull. Cal. Acad. **2**:415. 1887). Earlier authors

have placed our plants under *W. radicans* and *W. spinulosa*, but we here accept the narrowly limited species-conception of Maxon (Am. Fern Jour. 9: 68. 1919).

8. PITYROGRAMMA.

PITYROGRAMMA TRIANGULARIS (Kaulf.) Maxon, Contr. U. S. Nat. Herb. 17: 173. 1913.

Goldenback fern. Goldfern. Silverback fern.

Gymnogramme triangularis Kaulf. *Gymnogramme triangularis* var. *viscosa* D. C. Eaton. *Neurogramme triangularis* (Klf.) Diels. *Gymnopteris triangularis* Underw. *Ceropteris triangularis* Underw. *Ceropteris viscosa* Underw. *Pityrogramma triangularis* var. *viscosa* Weatherby. *P. triangularis* var. *Maxoni* Weatherby.

Illus.: Eaton, Ferns No. Am. pl. 48, f. 1-4 for *P. triangularis* and f. 5 for var. *viscosa*. 1880.

This species is common throughout our range, frequenting dry gravelly and stony ground at altitudes usually below 3000 ft.; extending occasionally to near 5000 ft. Off the mainland it has been found on Santa Cruz and Santa Rosa Islands (Brandegge, Zoe 1: 147. 1890 and Proc. Cal. Acad. (2) 1: 205 & 218. 1888); and on Catalina! and San Clemente (Lyon, Bot. Gaz. 11: 334 & 335. 1886). This fern exhibits several geographically correlated tendencies which have been indicated and named by Weatherby (Rhodora 22: 117 & 119. 1920). For our range these consist of a glutinous, usually white-backed form from the coastal portions of San Diego! and Orange Counties! and from Catalina Island!, and known as the variety *viscosa*. This variety has been considered distinct enough by some authors for treatment as a separate species. The common form in the region west of the mountains is usually yellow-backed and is not glutinous nor glandular; this is the typical form of the species. In some localities, as at

Laguna Beach! and Catalina Island!, the variety *viscosa* and the typical *triangularis* grow together. The desert form which is frequent in rocky canyons and on mountain sides of the Lower Sonoran Zone, and which differs from the typical form in the presence of glands on the upper surface and in usually having a paler under surface, is Weatherby's variety *Maxoni*. It must be understood that these are ill-defined varieties and that most material is difficult of determination; this situation is especially true in the case of the variety *Maxoni*.

9. PELLAEA.

A. Pinnules obtuse, not at all mucronate, 4-8 mm. wide; stipe straw-colored to light brown. *P. andromedaefolia*.

AA. Pinnules acute and mucronate, 1-3 mm. wide; stipe dark brown.

B. Leaves tripinnate, pinnules generally in groups of three; a plant of the valleys. *P. mucronatd.*

BB. Leaves bipinnate, pinnules generally single; a plant of the mountains mostly. *P. mucronata* var. *californica*.

PELLAEA ANDROMEDAEOFOLIA (Kaulf.) Fée. Gen. Fil. 129. 1850-52.

Coffee fern.

Pteris andromedaefolia Klf. *Allosorus andromedaefolius* (Klf.) Kunze. *Platyloma andromedaefolia* J. Smith. *Nothochlaena andromedaefolia* Keys. *Pellaea rafaensis* Moxley.

Illus.: Hall, A Yosemite Flora, p. 34. 1912. Eaton, Ferns No. Am., pl. 27, f. 1. 1879. Moxley, Am. Fern Jour. 5, pl. 8. 1915.

Common in rocky soil in the washes and in the hills on the coastal slopes of the Upper Sonoran Zone, ascending the lower canyons to about 3000 ft. alt. Approaching the desert in the region of Warners Hot Springs! (*Buttle*, Cal. Acad. Herb.) and Palm Springs! (*Munz 4697*). On the islands it can be reported as occurring on Catalina! (Brandege, Zoe 1: 115. 1890), San Clemente!

(*Evermann*, Cal. Acad. Herb.), Santa Cruz! (Greene, Bull. Cal. Acad. **2**: 415. 1887) and Santa Rosa (Greene Proc. Cal. Acad. (2) **1**: 218. 1888). When the plant grows in exposed situations, it may take on a reddish color, a condition which was described as var. *rubens* (Eaton, Bull. Torrey Cl. **6**: 360. 1879. & Ferns No. Am. **2**: 275. 1880). A slightly pubescent form has been collected at San Diego and called var. *pubescens* (Baker, Syn. Fil. 150. 1867).

PELLAEA MUCRONATA D. C. Eaton, Torr. Mex. Bound. Surv., 233. 1859.

Birds-foot fern.

Pellaea ornithopus Hook. *Allosorus mucronatus* D. C. Eaton. *Allosorus ornithopus* Kuntze.

Illus.: Hooker, Sp. Fil. **2**, pl. 116. 1858. Hall, A Yosemite Flora, p. 33. 1912. Eaton, Ferns No. Am. pl. 47, f. 7-10. 1880.

Common throughout our range in gravelly or stony soil, on the coastal slopes of the Upper Sonoran Zone. Ascending the mountains to 4500 feet alt. and extending to the edge of the desert as at Mountain Springs! (*Hall*, U. C. Herb.), Warners Hot Springs! (*Buttle*, Cal. Acad. Herb.), Palm Springs! (*Johnston*, Baker Herb.), Little San Bernardino Mts.! (*Munz & Johnston* 5225), and Victorville! (*Johnston* 2502). It has been collected on Catalina Island! (Lyon, Bot. Gaz. **11**: 334. 1886.) and Santa Cruz Island! (Greene, Bull. Cal. Acad. **2**: 415. 1887.). This fern was called *P. ornithopus* until Maxon revived the older specific name which we are using (Maxon, Proc. Biol. Soc. Wash. **30**: 180. 1917.).

PELLAEA MUCRONATA D. C. Eaton, var. **californica** (Lemmon), n. comb.⁴

Illus.: Hall, A Yosemite Flora, p. 33. 1912.

⁴ *P. Wrightiana* Hook. var. *californica* Lemmon. Ferns of Pac. Coast. p. 10. 1882. *P. Wrightiana compacta* Davenp. Cat. Davenp. Herb. Suppl. 46. 1883. *P. compacta* Maxon. Proc. Biol. Soc. Wash. **30**: 183. 1917.

Common on dry gravelly slopes of the Transition Zone in the San Jacinto! (Parish, Fern Bull. **12**: 8. 1904), San Bernardino! (Parish, l. c.), and San Gabriel Mountains! (Johnston, Pl. World **22**: 79. 1919), and in the Mt. Pinos region! (*Dudley & Lamb* 4648). Similar plants occur in the Upper Sonoran Zone in the desert region as at Pilot Knob! (*Johnston* 5568), the Providence Mts.! (Parish, l. c.) and in the Panamint Mts.! (*Jepson* 7036). The type was collected in the San Bernardino Mts. As indicated in a letter from Parish to Maxon (Maxon, Am. Fern Jour. **8**: 89. 1918), this fern occupies an area apart from that occupied by *P. mucronata*. It grows according to our observations in the arid pine belt of the higher mountains at from 5000 to 8000 ft. alt., and in the desert region far removed from the range of typical *mucronata*.

This plant has been current in California literature under *P. Wrightiana* and the names listed. In describing the species *P. compacta*, Maxon distinguishes it from *P. mucronata* by its "simple, less sharply mucronate pinnules, its congested habit, its long-stipitate fronds and its more broadly striped rhizome scales." Careful investigation of a good series of specimens convinces us that these characters do not vary together. Intermediates are common and exhibit every combination of the above characters. The most striking difference is in the arrangement of the pinnules and we have thought it best to refer to the variety those plants in which the fronds are bipinnate or predominantly so; the variety is further substantiated by a fairly distinct geographic range.

10. NOTHOLAENA.

A. Fronds not at all hairy nor scaly.

B. Fronds covered with a yellowish or white powder, especially below; blade deltoid; pinnae close. *N. californica*.

BB. Fronds not at all powdery; blade lanceolate; pinnae remote.

N. Jonesii.

AA. Fronds hairy or scaly.

B. Fronds scaly, once pinnate or bipinnatifid.

N. sinuata.

BB. Fronds woolly; bipinnate or tripinnatifid.

C. Fronds averaging 10-15 cm. long; tomentum close; plant not at all viscid; a species of coastal slopes.

N. Newberryi.

CC. Fronds averaging 7-12 cm. long; tomentum very loose, plant more or less viscid; a desert species.

N. Parryi.

NOTHOLAENA CALIFORNICA Eaton, Bull. Torrey Cl. **10**: 27. 1883.

In and about rocks and cliffs of Upper and Lower Sonoran Zones. Common about Palm Springs! and southward along the western edge of the Colorado Desert, as at Mountain Springs (Maxon, Contr. U. S. Nat. Herb. **17**: 603. 1916). On the Mohave Desert known only from near Victorville! (Munz & Johnston, Bull. Torrey Cl. **49**: 32. 1922). On coastal slopes the known stations are: Sweetwater Valley, San Diego Co. (Maxon, l. c. and Kimball, Fern Bull. **19**: 43. 1911); Temescal Canyon! (Johnston, Bull. So. Cal. Acad. **17**: 64. 1918); near San Jacinto! (*Munz & Johnston 5551*); Slover Mountain! near San Bernardino (Parish, Bot. Gaz. **15**: 51. 1890 and Maxon, l. c.); and Catalina Island (Maxon, l. c.). Treated in Bot. Cal. (**2**: 336. 1880) as *N. candida*, in most later references as *N. cretacea* until Eaton's *N. californica* was reinstated by Maxon (l. c.). Type locality given as San Diego County.

NOTHOLAENA JONESII Maxon, Am. Fern Jour. **7**: 106-109. 1917.

Illus.: Eaton, Ferns No. Am., pl. 43, f. 9-11. 1879.

A very rare fern of the desert region, occurring in rock-crevices in the Upper Sonoran Zone, at least in several cases on limestone cliffs. The following stations

are on record: northern base of San Bernardino Mts.! (Parish, *Erythea* 1: 153. 1893 and *Plant World* 20: 169. 1917), Palm Springs! (Parish, *Erythea* 1: 154. 1893), Piute Peak on Mohave Desert (Parish, *Fern Bull.* 12: 6. 1904), Providence Mts.! (Brandeggee, *Zoe* 5: 153. 1903 and Munz & Johnston, *Bull. Torrey Cl.* 49: 32. 1922), and Panamint Canyon (Maxon, l. c.). Mention should also be made of the questionable record from mountains of Santa Barbara Co. (Yates, *Bot. Gaz.* 11: 181. 1886 and Parish, *Erythea* 1: 154. 1893). From the first discovery this species has been treated as *N. tenera* until recently shown to be distinct by Maxon.

NOTHOLAENA SINUATA (Swartz) Kaulf. var. *INTEGRIRIMA* Hook. Sp. Fil. 5: 108. 1864.

Notholaena laevis Mart & Gal. *N. cochisensis* Goodding. Illus.: Eaton, *Ferns No. Am.* pl. 39, f. 1-6. 1879.

Locally abundant on a rocky hillside in a gulch back of the Bonanza King Mine, Providence Mts., Mohave Desert (Munz & Johnston, *Bull. Torrey Cl.* 49: 31. 1922).

NOTHOLAENA NEWBERRYI D. C. Eaton, *Bull. Torrey Cl.* 4: 12. 1873.

Cottony fern.

Illus.: Eaton, *Ferns No. Am.*, pl. 39, f. 11-14. 1879.

In our range common about dry rocky places in the lower hills of the Upper Sonoran Zone at elevations less than 1500 ft. Occurring commonly in coastal San Diego!, Riverside!, and Orange Counties!; sparingly in Los Angeles Co., as in hills south of Pomona! (*Baker 4733*), Rubio Canyon! (Davidson Herb.) and San Gabriel! (*Brewer 135*); and in San Bernardino County, where it is known from a single collection at Upland! (*Johnston 35*) and just over the county line in the hills south of San Bernardino!. The only specimen seen from the desert edge is from near Warners Hot Springs!

(*Buttle*, Cal. Acad. Herb.). It occurs also on San Clemente Island! (Lyon, Bot. Gaz. **11**: 335. 1886). Once reported from the Providence Mts. in eastern California (Brandegge, Zoe. **5**: 153. 1903) but that record was shown by Parish (Bot. Gaz. **65**: 334. 1918) to have been based on a misdetermination. The type locality is near San Diego.

NOTHOLAENA PARRYI D. C. Eaton. Am. Nat. **9**: 351. 1875.

Illus.: Eaton, Ferns No. Am., pl. 74, f. 5-9. 1880.

Frequent, often in great abundance locally, in rocky places in the desert region; occurring in the lower portions of the Upper Sonoran Zone up to about 4000 ft. alt. and in the Lower Sonoran Zone. There are numerous collections from about Palm Springs! (Pember, Am. Fern Jour. **2**: 13. 1912), from there extending southward to Mountain Springs! (Maxon, Am. Fern Jour. **10**: 3. 1920) and Yaqui Wells! (*Eastwood 2642*); eastward to Shavers Well! (*Jaeger*, Baker Herb.), Eagle Mts.! (*Munz & Keck 4823*), and Chuckawalla Mts.! (*Munz & Keck 4798*); extending northward along the east base of the San Bernardino Mountains to the Little San Bernardino Mts.! (*Munz & Johnston 5203*), Ord Mts.! and Victorville! Present also in the Providence Mts.! (*Munz & Johnston*, Bull. Torrey Cl. **49**: 32. 1922) and in the Panamint Mts.! (Coville, Contr. U. S. Nat. Herb. **4**: 22. 1893), where it is reported from 6000 ft. alt.

11. CHEILANTHES.

A. Indusia not continuous; fronds glabrous or if hairy more or less glandular-viscid.

B. Fronds deltoid, not at all viscid. C. *californica*.

BB. Fronds narrowly elongate, more or less viscid.

C. Fronds conspicuously hairy at base of stipe only; desert species. C. *viscida*.

CC. Fronds hairy throughout; a species of coastal hills.

C. Cooperae.

AA. Indusia continuous; fronds scaly or wooly.

B. Fronds woolly beneath.

C. Fronds without scales or coarse fibers. A fern of the eastern part of the Mohave Desert. *C. Feei.*

CC. Fronds either with scales or fibers. About the San Jacinto Mts.

D. Rachis with scales; pinnules loosely woolly below.

C. Parishii.

DD. Rachis with coarse fibrils; pinnules densely woolly below

C. fibrillosa.

BB. Fronds covered with imbricated scales below.

C. Rhizome creeping; stipes not closely placed on it. Scales on under side of frond uniform chestnut-brown and abundantly ciliate; blade of frond usually 6-10 cm. long.

C. Clevelandii.

CC. Rhizome short and branching, intricate; most of the stipes closely placed. Scales white to brown, scarcely if at all ciliate; blade of frond usually 10-15 cm. long.

C. Covillei.

CHEILANTHES CALIFORNICA (Nutt.) Mett. Abh. Senck. Nat. Gesell. 3: 88. 1859-61.

Lace fern.

Aspidotis californica Nutt. *Hypolepis californica* Hook. *Cheilanthes amoena* A. A. Eaton.

Illus.: Eaton, Ferns No. Am., pl. 6, f. 2. 1879.

Common on shaded cliffs and slopes of the Upper Sonoran Zone in the counties fronting the ocean; extending through the low passes into the coastal portion of Riverside County to the hills south of San Bernardino!, and from the ocean along the southern slope of the San Gabriel Mts.! to the Los Angeles County line. Reported also from Catalina Island (Brandegge, Zoe 1: 115. 1890). The Santa Cruz Island reference by Greene (Bull. Cal. Acad. 2: 415. 1887) is referable to *C. Clevelandii* (*myriophylla* acc. to Brandegge, Zoe 1: 147. 1890).

CHEILANTHES VISCIDA Davenp. Bull. Torrey Cl. 6. 191. 1877.

Illus.: Eaton, Ferns No. Am., pl. 12, f. 1. 1879.

Occasional about rocks of the Lower Sonoran Zone. First collected and best known from the region about Palm Springs! and from there extending southward along the western edge of the Colorado Desert to San Felipe Canyon! (*Brandege*, U. C. Herb.), Masons! (*Brandege*, U. C. Herb.), and Mountains Springs! (*Parish 9029*), On the Mohave it is known only from the Panamint Mts.! (*Coville*, Contr. U. S. Nat. Herb. 4: 227. 1893). Type locality is Whitewater, near Palm Springs.

CHEILANTHES COOPERAE D. C. Eaton, Bull Torrey Cl 6: 33. 1875.

Illus.: Eaton, Ferns No. Am., pl. 2, f. 1. 1879.

Rare and local on coastal slopes, in clefts of rocks in the Upper Sonoran Zone. In Southern California known only from Slover Mountain! near Colton (*Parish*, Bot. Gaz. 15: 51. 1890); near Piru! in Ventura Co. (given as "near Saugus" by *Davidson*, Cat. Plants of L. A. Co., p. 33. 1896); and in mountains near Santa Barbara! According to *Lemmon* (*Ferns of West*, p. 8. 1882) this fern grows only on limestone rocks. Type locality is near Santa Barbara. This species was reported from the Arroya Terquisquite east of Riverside by *Reed* (*Muhlenbergia* 5: 94. 1909).

CHEILANTHES FEEI Moore. Ind. Fil. 38. 1857.

Myriopteris gracilis Fée. *Cheilanthes lanuginosa* Nutt.
Myriopteris lanuginosa J. Smith.

Illus.: Eaton, Ferns No. Am., pl. 6, f. 1. 1879.
Frye & Jackson, Am. Fern Jour. 4, pl. 17, f. 7-8. 1914.
Fée, Gen. Fil. pl. 29, f. 6. 1850-52.

Known in California only from the Providence Mts.!, where it grows in crevices in the canyons at about 4000

ft. (Parish, Bot. Gaz. **65**: 334. 1918 and Munz & Johnston, Bull. Torrey Cl. **49**: 32. 1922). First collected in California by Brandegee and reported as *Notholaena Newberryi* (Zoe **5**: 153. 1903). A collection of *Notholaena Parryi* from San Diego Co. was reported as this species by Maxon (Am. Fern Jour. **8**: 119. 1918) who later corrected the error (op. cit. **10**: 3. 1920).

CHEILANTHES PARISHII Davenp. Bull. Torrey Cl. **8**: 61. 1881.

Illus.: Davenp. l. c., pl. 8.

Known only from about the type locality in Andreas Canyon! at the eastern base of the San Jacinto Mts., where it was discovered by Parish under a cliff in 1881 (Fern Bull. **9**: 73. 1901), re-collected by Saunders in 1908 (Fern Bull. **16**: 35. 1908) and again by Munz (No. 4696) in 1921. The Munz collection is a close match for the type, but the Saunders plant is quite atypical, being conspicuously less fibrillose and with smaller more remote segments.

CHEILANTHES FIBRILLOSA Davenp. Bull. Torrey Cl. **12**: 21. 1885.

Known only from the type collection by Parish! made in June 1882 (Fern Bull. **9**: 75. 1901) in the San Jacinto Canyon at Oak Cliff at the point where the road to Strawberry Valley leaves the canyon bed. The plant was found among rocks on a gravelly bench. An unsuccessful search for this fern was made at the type locality by Parish and Johnston in 1918; a similar one by the authors occurred in 1922 when the type locality and the water-shed above were examined.

CHEILANTHES CLEVELANDII D. C. Eaton. Bull. Torrey Cl. **6**: 33. 1875.

Illus.: Eaton, Ferns No. Am., pl. 12, f. 2. 1879.

Frequent in rocky places of the Upper Sonoran Zone, occurring along the foot of the coastal slopes of the

mountains of San Diego Co., northward in Riverside Co. where it extends along the western base of the San Jacinto Range to Beaumont! (Parish, Fern Bull. **12**: 7. 1904). It is also reported from Bartlett's Canal, Santa Barbara Co. (Maxon, Proc. Biol. Soc. Wash. **31**: 151. 1918). The plants from Santa Cruz Island! reported as *C. myriophylla* by Yates (Bull. Santa Barbara Soc. Nat. Hist. **1**: 10. 1890) and Brandegee (Zoe **1**: 147. 1890) are referable to *C. Clevelandii*, as are also those listed under the former name from Santa Rosa Island (Brandegee, l. c.). Type locality is given as "on a mountain about forty miles from San Diego."

CHEILANTHES COVILLEI Maxon. Proc. Biol. Soc. Wash. **31**: 147-9. 1918.

Bead fern.

Illus.: Eaton, Ferns No. Am., pl. 79, f. 8-15. 1880.

Wide spread and often locally common in rock-crevices or stony ground of the Upper Sonoran and Transition Zones, at elevations of from 2000 to 9000 ft. Over most of the desert area, extending into the mountains forming the coastal divide, and commonly descending the western slopes; present in the Santa Ana Mts.! (*F. M. Reed 3931*), but not occurring in the low hills along the coast. The Schoenfeldt collection referred to by Maxon (l. c.) as from Laguna, Orange Co. is rather to be referred to the Laguna Mts. of San Diego Co. This fern has been current under the names of *C. myriophylla* and *C. Fendleri*, but Maxon (l. c.) has shown that those names apply to extralimital plants.

12. CRYPTOGRAMMA.

CRYPTOGRAMMA ACROSTICHOIDES R. Br. App. Frankl. Jour. 767. 1823.

Parsley fern. American rock brake.

Illus.: Hall, A Yosemite Flora p. 35. 1912. Britton & Brown, Illus. Flora., fig. 74. 1913. Frye & Jackson,

Am. Fern Jour. 4, pl. 17, f. 9-11. 1914. Eaton, Ferns No. Am., pl. 59, f. 1-5. 1880.

Within our range known from the San Bernardino Mts. ! where it is relatively frequent in the Canadian and Hudsonian zones upon the northern slopes of Mts. San Bernardino and the adjacent ridges to the east. Rare on Mt. San Jacinto! only a few plants having been found about the summit (*Munz 6411*). The plant grows in rocky places.

13. ADIANTUM.

A. Blade at least as wide as long, divided into two equal parts, each with several pinnate branches. *A. pedatum* var.

aleuticum.

AA. Blade much longer than wide, not forked but with a continuous main rachis.

B. Indusia nearly continuous, becoming 8 mm. long; pinnae with more or less rounded, scarcely lobed margin and regular outline. *A. emarginatum*.

BB. Indusia distinct, about 2 mm. long; pinnae wedge shaped, deeply lobed and with irregular outline. *A. Capillus-Veneris*.

ADIANTUM PEDATUM L. var. ALEUTICUM Ruprecht.

Beitr. Pflanzenk. Russ. Reich 3: 49. 1845.

Maiden hair. Five-finger fern.

Illus.: Hall, A Yosemite Flora, p. 28. 1912.

Occasional in our range in moist, shaded rock-crevices in the Upper Sonoran Zone and higher, from 3500 to 8000 ft. alt. We know of the following stations: in San Bernardino Mts. in Snow Canyon! a "Hudsonian Island of Mill Creek Canyon" (Parish, Pl. World 20: 169. 1917); in the San Gabriel Mts. near Browns Flats! (*Johnston 1445*), in Little Santa Anita Canyon, on Mt. Wilson (Davidson, Cat. Pls. of L. A. Co., p. 33. 1896; and Moxley, Am. Fern Jour. 1: 104. 1911) and in Eaton Canyon! (*F. W. Peirson 1522*); in Santa Barbara Co. "in the northern portions of the county" (Yates, in Hall-Wood "Santa Barbara County as it is," p. 67.

1884); and on Santa Cruz Island! (Greene, Bull. Cal. Acad. **2**: 415. 1887).

ADIANTUM EMARGINATUM Hook. Sp. Fil. **2**: 39. 1851.

Maiden hair.

Adiantum Jordani C. Mull.

Illus.: Eaton, Ferns No. Am., pl. 38, f. 1-3. 1879.

A characteristic fern of the low coastal hills throughout our range. Common on moist shaded banks and at base of rocks and trees in the Upper Sonoran Zone below 2000 ft. elevation. We have seen specimens from Catalina! (Lyon, Bot. Gaz. **11**: 334. 1886), San Clemente (*Evermann*, Cal. Acad. Herb.), Santa Rosa! and Santa Cruz! (Brandegge, Proc. Cal. Acad. (2) **1**: 205, 218. 1887). In the desert region it has been collected at Palm Springs (Parish, Fern Bull. **12**: 6. 1904) and in the Panamint Mts. (Coville, Contr. U. S. Nat. Herb. **4**: 228. 1893). Known in the literature as *A. Jordani* and *A. emarginatum*, the older of which names we have accepted.

ADIANTUM CAPILLUS-VENERIS L. Sp. Pl. 1096. 1753.

Venus' hair fern. Maiden hair fern.

Illus.: Eaton, Ferns No. Am., pl. 37. 1879.

This inhabitant of calcareous seeps is frequent in the Upper Sonoran Zone of the coastal slopes, where it ascends to about 4000 ft. On the islands it has been collected at Catalina! (McClatchie, *Erythea* **2**: 77. 1894) and Santa Cruz (Greene, Bull. Cal. Acad. **2**: 415. 1887). The known stations on the desert are Coachella Valley! (*Rixford*, Cal. Acad. Herb.), about Palm Springs!, and in Hanaupah Canyon! in the Panamint Mts. (*Dixon*, U. C. Herb.). A "dichotomously forking and crested" form of this species from Eaton Canyon! in the San Gabriel Mts. has been described by Moxley as *forma cristatum* (Am. Fern Jour. **9**: 27. 1919.)

14. PTERIDIUM.

PTERIDIUM AQUILINUM (L.) Kuhn, var. PUBESCENS
Underw. Our native ferns, ed. 6: 9. 1900.

Brake. Bracken.

Illus.: Hall, A Yosemite Flora, p. 30. 1912. Frye
& Jackson, Am. Fern Jour. 4, pl. 19. 1914.

Common as a ground cover on the gentler slopes in the open pine forests, and somewhat less common in wet places. Occurring most abundantly in the Transition Zone, from which it occasionally ascends into the Canadian Zone, as at Tamarack Valley! in the San Jacinto Mts. (*Munz 6035*) where it occurs at 9200 ft. alt. Infrequent in a ranker form in springy places and on stream-banks of the Upper Sonoran Zone and extending even into the valleys, as at Red Hill, Upland! where it has fronds ten ft. long. Throughout our range on the coastal slopes and on Santa Rosa Island, (Brandegge, Proc. Cal. Acad. (2) 1: 218. 1888) and on Santa Cruz Island (Greene, Bull. Cal. Acad. 2: 415. 1887).

15. POLYPODIUM.

A. Pinnae usually more than 3 cm. long, and pointed, with serrate margins; plant of less than 4000 ft elevation.

P. californicum.

AA. Pinnae usually less than 2½ cm. long, rounded at tips, margins entire or crenate, plant of high altitudes. *P. vulgare*, var.

hesperium.

POLYPODIUM CALIFORNICUM Kaulf. Enum. Fil. 102. 1824.

Rock fern. Californian polypody.

Illus.: Eaton, Ferns No. Am., pl. 31, f. 4-5. 1879.

Common on the coastal drainage, on rocky ledges in the canyons and on moist slopes of the lower hills of the Upper Sonoran Zone, ascending to an elevation of about 4000 ft. Island records are as follows: San Clemente (Lyon, Bot. Gaz. 11: 335. 1886), Santa Cruz (Greene, Bull. Cal. Acad. 2: 415. 1887), Catalina!

(Brandege, Zoe 1: 115. 1890), and Santa Rosa (Brandege, Proc. Cal. Acad. (2) 1: 218. 1888).

A form exhibiting a leathery texture and a greater tendency for fusion of veins, grows mainly in a narrow belt in the immediate vicinity of the ocean and was called by Eaton, var. *Kaulfussii* (Ferns No. Am. 1: 244. 1879). It is this thick leaved form that is the basis of the numerous reports of *P. Scouleri* from the islands of Southern California, (Parish, Fern Bull. 9: 40-42. 1901; Yates, Bull. Santa Barb. Soc. Nat. Hist. 1: 9. 1890; Brandege, Zoe 1: 115. 1890; and Trask, Erythea 7: 142. 1899).

POLYPODIUM VULGARE L., var. HESPERIUM (Maxon)
Nels. & Macbr. Bot. Gaz. 61: 30. 1916.

Polypodium hesperium Maxon.

Illus.: Frye & Jackson, Am. Fern Jour. 4: pl. 20, f. 3-4. 1914.

Known within our limits only from the San Bernardino Mts., where it grows in rock crevices in the Hudsonian Zone (Parish, Fern Bull. 9: 76. 1901 and Pl. World 20: 169. 1917), and from the San Jacinto Mts., where it has been recently collected on the north side of Tahquitz Peak (Kessler, Baker Herb.).

II. OPHIOGLOSSACEAE.

KEY TO GENERA.

- | | |
|---|---------------------------|
| A. Leaf simple; fertile portion a spike. | 16. <i>Ophioglossum</i> . |
| AA. Leaf lobed or divided; fertile portion a panicle. | 17. <i>Botrychium</i> . |

16. OPHIOGLOSSUM.

OPHIOGLOSSUM CALIFORNICUM Prantl. Ber. deutsch, bot.
Ges. 1: 351. 1883.
California adder's tongue.

Illus.: Prantl, Jahrb. kön. bot. Gart. Berlin **3**: 315. pl. 7, f. 11. 1884. E. Britton, Bull. Torrey Cl. **24**, pl. 319, f. 4. 1897.

In Upper Sonoran Zone, in grassy and stony spots on mesas about San Diego! Discovered by Parry at San Diego in 1850, rediscovered by Parry and Cleveland in 1882 (Cleveland, Bull. Torr. Cl. **9**: 55. 1882). Reported as *O. vulgatum* by Davenport (Bull. Torrey Cl. **9**: 71. 1882), as *O. nudicaule* L. f. by McClatchie (Proc. So. Cal. Acad. **1**: 392. 1897), and as *Botrychium nudicaule* by Jones (Bull. Torrey Cl. **9**: 91. 1882) who, reporting it as quite common from Temecula Canyon southward, wrote, "The plant is very inconspicuous, and usually springs up and vanishes in less than six weeks." According to Orcutt, in lit., it is abundant in dry ground on the mesa lands near San Diego and usually associated with *Selaginella* and *Dodecatheon Clevelandi*, sometimes found growing in rocky hollows or near large rocks, but usually most abundant on mesas and in great numbers when present, reaching its best development the last of April and first of May.

17. BOTRYCHIUM.

A. Sterile blade slightly bent over in the bud of the following season, clasping the nearly erect sporophyll. *B. Lunaria.*

AA. Sterile blade and sporophyll both erect in the bud of the following season. *B. simplex.*

BOTRYCHIUM LUNARIA (L.) Swartz. Schrad. Jour. Bot. **2**: 110. 1800.

Moonwort.

Illus.: Britton & Brown, Illus. Flora, fig. 5. 1913.

At present known only from the San Antonio Mts.! where it has been collected only in a single locality in the Upper Transition Zone (Johnston, Pl. World **22**: 78. 1919). Frequent in springy ground near 7000 ft. alt. in the Coldwater Fork of Lytle Creek.

BOTRYCHIUM SIMPLEX E. Hitchc. Am. Jour. Sci. **6**: 103. 1823.

Little Grape-fern.

Illus.: Britton & Brown, Illus. Flora, fig. 4. 1913.

Reported only from the Canadian Zone of the San Bernardino Mts., where it occurs sparingly in two localities: Mill Creek Canyon (Robertson, Fern Bull. **15**: 17. 1907 and Parish, Muhlenbergia **3**: 57. 1907) and Big Meadows (Parish, Pl. World **20**: 169. 1917).

It is abundant in the meadows along the South Fork of the Santa Ana River from 7500 to 8500 ft. alt. (*Munz 6164*), growing on slight elevations and about old logs and stumps where there is some drainage.

III. MARSILEACEAE.

KEY TO GENERA.

A. Leaf-blades present; plants hairy.

18. *Marsilea*.

AA. Leaf-blades absent; plants smooth.

19. *Pilularia*.

18. MARSILEA.

MARSILEA VESTITA Hook. & Grev., Icon. Fil. **2**, pl. 159. 1831.

Horse clover.

Marsilea mucronata A. Br.

Illus.: Frye & Jackson, Am. Fern Jour. **4**: pl. 21, f. 1. 1914. Clute, The fern allies, p. 200. 1905. Campbell, Mosses and ferns, p. 417. 1913.

Infrequent on muddy banks of the Upper Sonoran Zone and known only from the following localities within our range: San Diego and Del Mar (Underwood, Zoe **1**: 99. 1890), Ramona! (*K. Brandegee*), Cuyamaca Mts.! (Parish, Fern Bull. **12**: 11. 1904); Thomas Valley in San Jacinto Mts.! (*Munz & Johnston 5446*), near Laguna Beach!, Orange Co. (*Crawford et. al. Baker Herb.*); near Santa Monica (Davidson, Cat. Pls. L. A.

Co., p. 34. 1896), West Riverside! (*Pringle*, U. C. Herb.), near Elsinore! (*Munz 5071*), and near Moreno at the foot of the Jackrabbit Trail! (*Munz & Johnston 5154*).

19. PILULARIA.

PILULARIA AMERICANA A. Br. Monatsb. kön. Akad. Wiss. Berlin 1863: 435. 1863.

Pillwort.

Calamistrum americanum O. Ktze.

Illus.: Clute, The fern allies, p. 206. 1905. Campbell, Mosses and ferns, p. 430. 1913.

Rare and local in our range, in the Upper Sonoran Zone, in heavy soil of bottoms of vernal pools. Known only from mesas of San Diego Co., as at Romona! and San Diego (Parish, Fern Bull. **12**: 11 & 83. 1904); Red Hill!, near Upland in San Bernardino Co. (Parish, Bull. So. Cal. Acad. **16**: 51. 1917 and Bot. Gaz. **65**: 334. 1918); near Elsinore ! (*Munz 5087*) and in Meniffee Valley! (*Munz & Johnston 5567*) in Riverside Co.; and near Santa Barbara (Bot. Cal. **2**: 352. 1880).

IV. SALVINIACEAE.

20. AZOLLA.

AZOLLA FILICULOIDES Lam. Encyc. **1**: 343. 1783.

Water fern.

Illus.: Clute, The fern allies, p. 184. 1905. Campbell, Mosses and ferns, p. 416. 1913.

Frequent as a floating plant along sluggish streams, on pools, and on muddy banks in the Upper Sonoran Zone of the coastal drainage; usually below 1000 ft. alt. On the desert known only from Daggett (Coville, Contr. U. S. Nat. Herb. **4**: 227. 1893) whence reported as *A. caroliniana*, but this reference, as apparently all others from Southern California, applies to *A. filiculoides*.

V. ISOETACEAE.

21. ISOETES.

A. Plants normally submerged; spores with low tubercles; plants of high altitudes *I. Bolanderi*.

AA. Plants of ephemeral winter pools; spores smooth; low altitudes. *I. Orcuttii*.

ISOETES BOLANDERI Engelm. Parry. Am. Nat. **8**: 214. 1874.

Illus.: Clute, The fern allies, p. 228. 1905.

"Formerly in the shallow stream which drained Bear Valley, which is now deeply submerged by the reservoir" (Parish, Pl. World **20**: 171. 1917). In 1918 discovered by H. H. Tracy at Switzers Meadows! growing along a brook that leads into Little Bear Lake (Arrowhead Lake) in the same mountains.

ISOETES ORCUTTII A. A. Eaton, Fern Bull. **8**: 13. 1900.

Illus.: Clute, The fern allies, p. 253. 1905.

Rare and local, known only from winter pools on the mesas near San Diego! (type locality), and near Upland! in San Bernardino Co. Specimens from these localities have been referred by various authors to *I. melanopoda* var. *pallida* (Parish, Bot. Gaz. **65**: 334. 1918 and Bull. So. Cal. Acad. **16**: 51. 1917) and to *I. Nuttallii* (McClatchie, Proc. So. Cal. Acad. **1**: 393. 1897). According to Dr. Norma Pfeiffer, in lit., our plants can be placed in *I. Orcuttii* except certain of Brandegee's San Diego collections which combine some of the characters of *I. Nuttallii*. We feel the agreement in range outweighs the atypical morphological characters and therefore, for the present, place all our material in *I. Orcuttii*.

(To be continued.)

Notes on the Fern Leaf Industry

GUSTAVE THOMMEN

The fern leaf industry constitutes an important item in the business of florists engaged in growing and selling